The BiBlade Sampler for Small Body Sample Return Matured for a Comet Surface Sample Return Mission

Completed Technology Project (2015 - 2017)

Project Introduction

The goal of the work is to mature the BiBlade sampling chain from TRL 4 to TRL 6 to provide NASA with a new sampling approach for small body sampling missions and particularly to provide a system that collects samples that meet all of the objectives of a Comet Surface Sample Return (CSSR) mission as stated in the Decadal Survey. This work will mature the new BiBlade sample chain technology making it ready for inclusion in a NASA small body sampling mission such as a Discovery or New Frontiers sample return mission. The BiBlade sampler could be used in various mission architectures, but was initially designed for use in a Touch-and-Go mission architecture where a spacecraft maneuvers to within about four meters of a comet's surface and the sampling tool is deployed to the surface by a robotic arm. The BiBlade system includes the sampling tool, deployment arm, sample chambers in the Sample Return Capsule, and sample measurement. The BiBlade sampler satisfies both the Group 1 and Group 2 requirements for a CSSR mission as stated in the NASA Decadal Survey, 'Visions and Voyages for Planetary Science in the Decade 2013-2022', including: return a single >= 500 cc sample from the surface of any comet nucleus; preserve sample complex organics; prevent aqueous alteration of the sample; return material from depth >= 10 cm; maintain sample stratigraphy. A TRL 6 version of the sampling system will be fabricated and validated including sampling testing across a relevant simulant suite, testing with realistic spacecraft dynamics, and testing in an environmental chamber. The BiBlade sampler drives two blades into the surface in about 0.1 seconds and combines the sampling and encapsulation functions in one step. The BiBlade sampling chain has the following combined important capabilities: return of two 500 cc samples from different locations on a small body using one sampling tool; multiple sampling attempts per sample; direct measurement of the sample, and; acquisition of sample to 10 cm depth while maintaining stratigraphy.

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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Maturation of Instruments for Solar System Exploration

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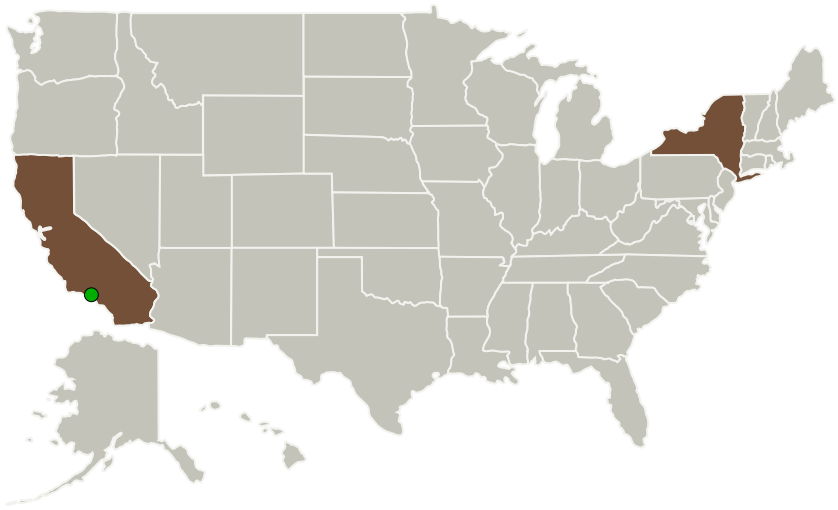
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New York

Project Management

Program Director:

Carolyn R Mercer

Program Manager:

Haris Riris

Principal Investigator:

Paul G Backes

Co-Investigators:

Kris Zacny
Karen R Piggee
Mircea Badescu
Christopher Mcquin
Harish M Manohara
Gale L Paulsen
Jacklyn R Green

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.3 Sample Handling

Target Destination

Others Inside the Solar System